

anodic protection. Imposing an external electrical potential to protect a metal from corrosive attack. (Applicable only to metals that show active-passive behavior.) Contrast with *cathodic protection*.

anodizing. Forming a *conversion coating* on a metal surface by anodic oxidation; most frequently applied to aluminum.

anolyte. The electrolyte adjacent to the anode in an electrolytic cell.

antiferromagnetic material. A material wherein interatomic forces hold the elementary atomic magnets (electron spins) of a solid in alignment, a state similar to that of a *ferromagnetic material* but with the difference that equal numbers of elementary magnets (spins) face in opposite directions and are antiparallel, causing the solid to be weakly magnetic, that is, paramagnetic, instead of ferromagnetic.

antipitting agent. An *addition agent* for electroplating solutions to prevent the formation of pits or large pores in the electrodeposit.

anvil. (1) In drop forging, the base of the hammer into which the *sow block* and lower die part are set. (2) A block of steel upon which metal is forged.

anvil cap. Same as *sow block*.

apparent density. (1) The weight per unit volume of a metal powder, in contrast to the weight per unit volume of the individual particles. (2) The weight per unit volume of a porous solid, where the unit volume is determined from external dimensions of the mass. Apparent density is always less than the true density of the material itself.

approach distance. The linear distance, in the direction of feed, between the point of initial cutter contact and the point of full cutter contact.

Ar₁₀₀, Ar₁, Ar₂, Ar₃, Ar₄, Ar₅, Ar₆. Defined under *transformation temperature*.

arbitration bar. A test bar, cast with a heat of material, used to determine chemical composition, hardness, tensile strength, and deflection and strength under transverse loading in order to establish the state of acceptability of the casting.

arbor. (1) In machine grinding, the spindle on which the wheel is mounted. (2) In machine cutting, a shaft or bar for holding and driving the cutter. (3) In founding, a metal shape embedded in green sand or dry sand cores to support the sand or the applied load during casting.

arbor press. A machine used for forcing arbors or mandrels into drilled, or bored parts preparatory to turning or grinding. Also used for forcing bushings, shafts or pins into or out of holes.

arbor-type cutter. A cutter having a hole for mounting on an arbor and usually having a keyway for a driving key.

arc blow. The swerving of an electric arc from its normal path because of magnetic forces.

arc brazing. A brazing process in which the heat required is obtained from an electric arc.

arc cutting. A group of cutting processes that melt the metals to be cut with the heat of an arc between an electrode and the base metal. See *metal-arc cutting*, *gas tungsten-arc cutting*, *plasma-arc cutting*.

arc furnace. A furnace in which material is heated either directly by an electric arc between an electrode and the work or indirectly by an arc between two electrodes adjacent to the material.

arc gouging. An arc cutting procedure used to form a bevel or groove.

arc melting. Melting metal in an electric arc furnace.

arc of contact. The portion of the circumference of a grinding wheel or cutter touching the work being processed.

arc time. The time the arc is maintained in making an arc weld. Also known as *weld time*.

arc voltage. The voltage across any electric arc—for example, across a welding arc.

arc welding. A group of welding processes that fuse metals together by heating them with an arc, with or without the application of pressure and with or without the use of filler metal.

artifact. A feature of artificial character (such as a scratch or a piece of dust on a metallographic specimen) that can be erroneously interpreted as a real feature. In inspection, an artifact often produces a *false indication*.

artificial aging. Aging above room temperature. See *aging*. Compare with *natural aging*.

athermal transformation. A reaction that proceeds without benefit of thermal fluctuations—that is, thermal activation is not required. Such reactions are

diffusionless and can take place with great speed when the driving force is sufficiently high. For example, many martensitic transformations occur athermally on cooling, even at relatively low temperatures, because of the progressively increasing driving force. In contrast, a reaction that occurs at constant temperature is an *isothermal transformation*; thermal activation is necessary in this case and the reaction proceeds as a function of time.

atmospheric riser. A riser that uses atmospheric pressure to aid feeding. Essentially a *blind riser* into which a small core or rod protrudes, the function of the core or rod being to provide an open passage so that the molten interior of the riser will not be under a partial vacuum when metal is withdrawn to feed the casting, but will always be under atmospheric pressure. Often called *Williams riser*.

atomic fission. The breakup of the nucleus of an atom in which the combined weight of the fragments is less than that of the original nucleus, the difference being converted to a very large energy release.

atomic hydrogen welding. An arc welding process that fuses metals together by heating them with an electric arc maintained between two metal electrodes enveloped in a stream of hydrogen. Shielding is provided by the hydrogen, which also carries heat by molecular dissociation and subsequent recombination. Pressure may or may not be used and filler metal may or may not be used. (This process is now of limited industrial significance.)

atomic number. The number of protons in an atomic nucleus, which determines the individuality of the atom as a chemical element.

atomic percent. The number of atoms of an element in a total of 100 representative atoms of a substance.

atomization. The dispersion of a molten metal into small particles by a rapidly moving stream of gas or liquid.

attenuation. The fractional decrease of the intensity of an energy flux, including the reduction of intensity resulting from geometrical spreading, absorption and scattering.

attritious wear. Wear of abrasive grains in grinding such that the sharp edges gradually become rounded. A grinding wheel that has undergone such wear usually has a glazed appearance.

ausforming. Hot deformation of metastable austenite within controlled ranges of temperature and time that avoids formation of nonmartensitic transformation products.

austempering. A heat treatment for ferrous alloys in which a part is quenched from the austenitizing temperature at a rate fast enough to avoid formation of ferrite or pearlite and then held at a temperature just above *M_s* until transformation to bainite is complete.

austenite. A solid solution of one or more elements in face-centered cubic iron. Unless otherwise designated (such as nickel austenite), the solute is generally assumed to be carbon.

austenitic grain size. The size attained by the grains of steel when heated to the austenitic region; may be revealed by appropriate etching of cross sections after cooling to room temperature.

austenitic steel. An alloy steel whose structure is normally austenitic at room temperature.

austenitizing. Forming austenite by heating a ferrous alloy into the transformation range (partial austenitizing) or above the transformation range (complete austenitizing). When used without qualification, the term implies complete austenitizing.

autofrettage. Prestressing a hollow metal cylinder by the use of momentary internal pressure exceeding the yield strength.

autogenous weld. A fusion weld made without the addition of filler metal.

automatic brazing. Brazing with equipment that performs the brazing operation without constant observation and adjustment by a brazing operator. The equipment may or may not load and unload the work.

automatic press. A press in which the work is fed mechanically through the press in synchronism with the press action. An automation press is an automatic press that, in addition, is provided with built-in electrical and pneumatic control equipment.

automatic welding. Welding with equipment that performs the welding operation without adjustment of the controls by an operator. The equipment may or may not load and unload the work. Compare with *machine welding*.

automation press. See *automatic press*.

autoradiography. An inspection technique in which

radiation spontaneously emitted by a material is recorded photographically. The radiation is emitted by radioisotopes that are (a) produced in a metal by bombarding it with neutrons, (b) added to a metal such as by alloying, or (c) contained within a cavity in a metal part. The technique serves to locate the position of the radioactive element or compound.

auxiliary anode. In electroplating, a supplementary anode positioned so as to raise the current density on a certain area of the cathode and thus obtain better plate distribution.

Avogadro's number. The number of atoms (or molecules) in a mole of substance, which equals 6.02252×10^{23} per mole.

axial rake. For angular (not helical) flutes, the angle between a plane containing the tooth face and the axial plane through the tooth point. See sketch accompanying *face mill*.

axial relief. The relief or clearance behind the end cutting edge of a milling cutter.

axial runout. For any rotating element, the total variation from a true plane of rotation, taken in a direction parallel to the axis of rotation. Compare with *radial runout*.

axis of weld. A line through the length of a weld perpendicular to the cross section at its geometric center.

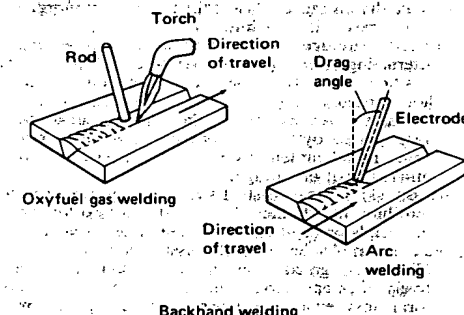
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back draft. A reverse taper on a casting pattern or a forging die that prevents the pattern or forged stock from being removed from the cavity.

back extrusion. See *backward extrusion*.

backfire. The recession of a flame into the tip of a torch followed by immediate reappearance or complete extinction of the flame. See *flashback*.

backhand welding. Welding in which the back of the principal hand (torch or electrode hand) of the welder



faces the direction of travel. It has special significance in oxyfuel gas welding in that the flame is directed backward toward the weld bead, which provides *postheating*. Compare with *forehand welding*.

backing. (1) In grinding, the material (paper, cloth or fiber) that serves as the base for coated abrasives. (2) In welding, a material placed under or behind a joint to enhance the quality of the weld at the root. It may be a metal backing ring or strip, a pass of weld metal, or a nonmetal such as carbon, granular flux or a protective gas.

backlash. Lost motion, play or movement in moving parts such that the driving element (as a gear) can be reversed for some angle or distance before working contact is again made with a driven element.

backoff. A rapid withdrawal of a grinding wheel or cutting tool from contact with a workpiece.

back rake. The angle on a single-point turning tool corresponding to axial rake in milling. It is the angle measured between the plane of the tool face and the reference plane and lies in a plane perpendicular to the axis of the work material and the base of the tool. See sketch accompanying *single-point tool*.

backstep sequence. A longitudinal welding sequence

